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Lymphocystis Disease in *Angelichthys.*

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(Plates I-III).

A cutaneous disease in fishes, particularly in flounders, characterized by the formation of small, irregular, solitary or confluent nodules of grayish-white color has been studied by a number of investigators (Woodcock, 1904; Awerinzew, 1909; Weissenberg, 1914; Benisch, 1937). Earlier studies indicated that this peculiar disease in fishes was caused by some form of *Cnidosporidia.* More recent studies tend toward an explanation that an unknown virus may be the principal causative factor (Weissenberg, 1914; Benisch, 1937). The small nodules forming the visible features of the disease lie directly below the epithelium of the skin. Histologically the lesions exhibit an immense hypertrophy of individual cells of the host. Hypertrophied cells may show a diameter many times the normal. The cytoplasm of such cells is surrounded by a dense cell membrane. The cell nucleus is also enlarged and stains paler than normal. Cell inclusions of various sizes, shape, and arrangement can be demonstrated in the cytoplasm, and these are regarded as the evidence of the activity of a living though invisible virus which has initiated striking structural changes in the cells.

Two instances of lymphocystis disease occurring in the adult common angelfish (*Angelichthys isabelita*) have come under observation recently at the New York Aquarium. These fishes occupied a large salt-water tank with about ten other angelfishes of the same species. The victims of the disease were apparently in good health at the time they were received at the Aquarium, and it is our impression that the onset of the infection took place during the period of their captivity.

On inspection both angelfishes presented numerous dark grayish patches and nodules on the surface of the skin, most conspicuous in the region of the base of fins and at the base of the tail. In some areas the individual nodules were as much as one and one-half centimeters in diameter. Plate I, Figure 1, shows one of these nodules, somewhat enlarged, which was removed for biopsy from the region of the dorsal fin, and in the photograph the mass is seen as attached to one of the rays of this fin. Plate I, Figure 2, shows the same specimen cleared in cedar oil, which permits a transillumination of the specimen, in order to show the small pin-point black dots covering the surface of the tumor and often giving it a dark hue. Each black dot represents a single or a group of corial melanophore cells of the

skin overlying the growth. On cross-section of the tumor, the tissue is found to be grayish-white in color, and very soft. The nodules are confined strictly to the skin, and do not invade the deeper lying muscles. The tumor tissues removed for biopsy were preserved in 10% formalin, and the sections were prepared by the paraffin method. The stains employed were eosin and methylin blue and hematoxylin and eosin. It is realized that other forms of fixation and staining will have to be used in future studies, in order to insure a more satisfactory analysis of cytological detail, particularly from the standpoint of cell inclusions.

Plate II, Figure 3, and Plate III, Figure 5, are the photomicrographs of the structure of one of the skin nodules. The overlying epithelium is considerably thickened and hyperplastic, attaining a depth of from fifteen to twenty cells. Numerous mucous cells are found in the epithelium, and in some fields they are greatly distended, almost cystic in appearance. Below the epithelium lies a thickened corium, containing scattered melanophores. It is just below this point that the characteristic lesion of lymphocystis disease becomes apparent. The tissue here assumes the appearance of a spongy network of fibrous compartments containing hypertrophied cells varying greatly in size and contour. These enormous cells (Plate II, Figure 4, and Plate III, Figure 6) lie in a thickened tissue framework composed of elongated connective tissue cells, at times hyaline in appearance. The hypertrophied cells contain a fine granular cytoplasm with some basophilic material at the periphery. In many sections cut at the proper level, a pale-staining nucleus with one or two nucleoli can be distinguished. The larger cells, measuring often as much as 468 microns, show irregular and pale nuclei with beaded and festooned chromatin collections at the periphery. Of great interest was the finding of bright-staining eosinophilic hyaline-like bodies in some of these distorted nuclei. Such red-staining intranuclear masses resemble inclusion bodies characteristic of certain virus diseases. Further studies with different fixations and staining technique will be necessary to determine this point. Where the fixation of the tissues has been uniform and satisfactory, it is seen that the largely hypertrophied cell has a distinctly thickened cell membrane. In many areas the cytoplasm of large diseased cells has shrunk away from its surrounding fibrous structures.

An impression is gained that a low grade inflammation accompanies this hypertrophic process affecting the cells of the host, as there are many collections of lymphocytes in the various microscopic fields examined, such as is seen for example in Plate III, Figure 5.

Summary.

Lymphocystis disease occurring in the angelfish (*Angelichthys isabelita*) is described, and structural arrangement of the characteristic cutaneous nodules is discussed.

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EXPLANATION OF THE PLATES.

Plate I.

Fig. 1. A nodule of lymphocystis tissue removed for biopsy, enlarged eight times. It is attached to a fragment of the dorsal fin ray.

Fig. 2. The same nodule, slightly lower magnification, cleared in cedar oil, transilluminated to show the minute black dots representing melanophore cells of the skin overlying the tumor. x 7.

Plate II.

Fig. 3. Section of spongy network of lymphocystis disease lying below thickened epithelium. Hypertrophic cells are seen lying in fibrous tissue compartments. x 65.

Fig. 4. A single hypertrophied cell. x 250.

Plate III.

Figs. 5 and 6. Hypertrophied lymphocystis cells. x 125.